SOIL CONSERVATION DIGEST

U. S. Department of Agriculture
Soil Conservation Service
Region 10
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Dear Cooperator:

Soil conservationists are greatly encouraged by the increased interest in pastures in California. In widely separated counties important changes in land use are taking place. Land that has become marginal for deciduous fruits or for clean-tilled crops may be put to effective use as pasture, thereby controlling erosion. Rotating sloping land to pasture for a few years improves the tilth and fertility of the soil as well as preventing soil and water losses. On some slopes the rotation may include a clean-tilled crop once in four or five years, particularly if the clean-tilled crop is grown in rotated, wide, contour strips.

Increasing crop yields is not the immediate objective of soil conservation. However, the maintenance and the increase of soil productivity underlies the present need to prevent soil and water losses. Soil and water conservation and the maintenance of soil fertility are both achieved by the same simple and practical cropping practices.

Inducing more complete absorption of the rainfall where it falls is the first principle of soil conservation on cultivated land. Thus, the control of erosion on tilled land is under most conditions dependent upon stable systematic methods of crop rotation, strip cropping, tillage, and replenishing the organic matter content of the soils.

CROP ROTATION

A soil and moisture conserving crop rotation that will protect the soil from washing and improve crop yields can be easily started with a winter cover crop. Not only does a system of crop rotation in which green manure crops are used offer the agriculturist on poor or eroded soils an opportunity to rebuild them, but it affords every farmer an economical and practical method of maintaining the fertility of his soils. Rotation of crops allows provision for a maximum of close-growing crops during the winter rainy season and thus is a direct agent of soil conservation. However, rotations and systems of farm management which will control erosion are not established by unyielding formulas. Each farmer will of necessity have to adapt the fundamental facts of rotation to the tillage of his soil and to his managerial system.

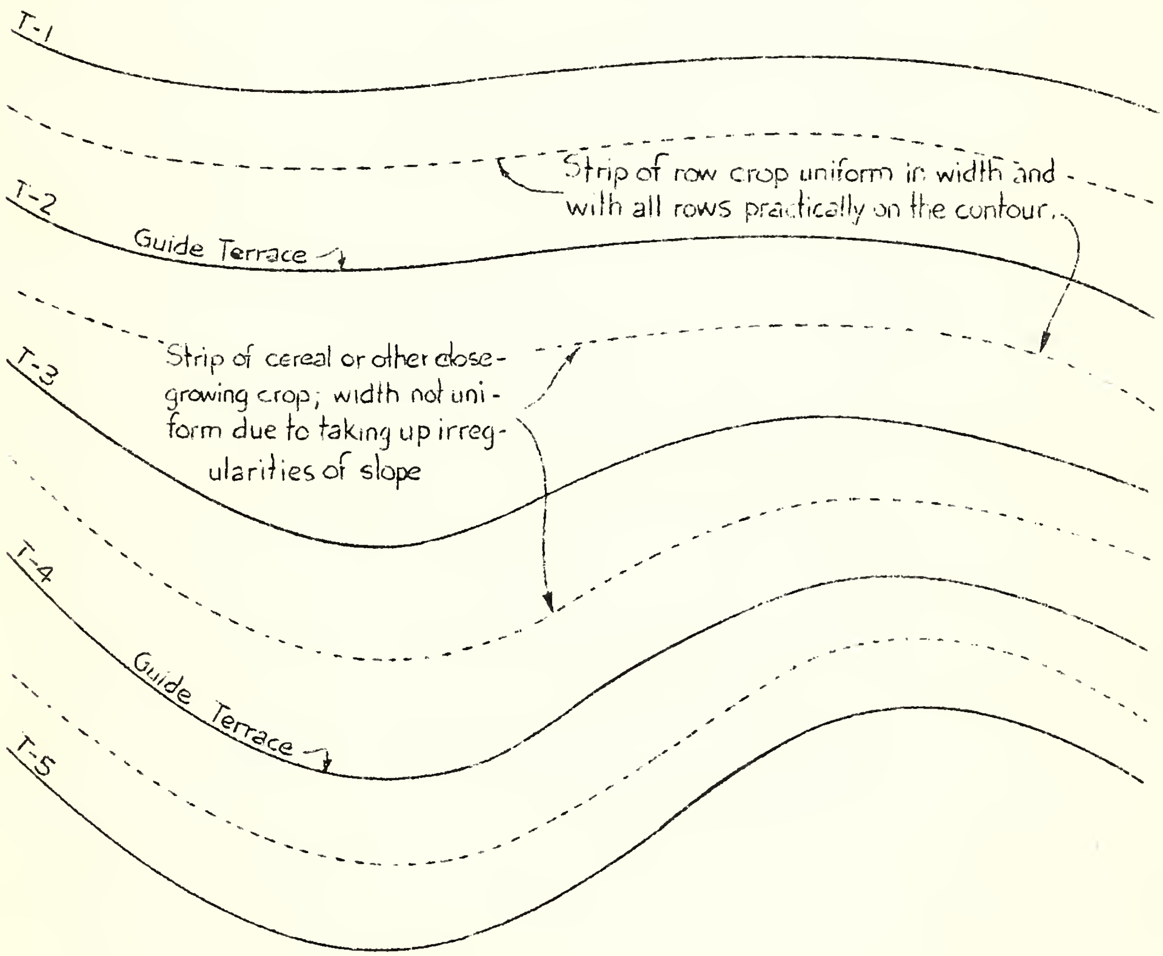
Crops may be rotated advantageously from field to field over periods of two or more years. For example, where summer crops such as beans, corn, or tomatoes are grown this year, flax, oats, barley, or other winter crops may be grown next year, to be followed by a green manure crop the third year. In such a rotation, if three fields or three strips are used, there is a yearly change of crops on every field that conserves not only the soil and water but the fertility of the soil as well.

With irrigation, a two-year rotation of sugar beets and lima beans has proven satisfactory if the beanstraw and beet tops are turned under to help maintain humus in the soil. One of the most important advantages of crop rotation is the provision for periodically incorporating organic matter into the soil.

STRIP CROPPING

The adoption of the practice of rotating crops makes possible the use of other important erosion preventing practices. Instead of planting the crops in 3 separate fields when following a 3-year rotation, these crops may be arranged in broad contour strips in each field or in one large field.

In laying out a strip cropping system, it is always advisable to keep the cultivated row-crop strip uniform in width to eliminate point rows. Knolls, swales, and irregularities of slope may make it necessary to vary the width of strips in places, but such irregular areas can usually be included in the close-growing strips of hay, grain, or green manure crops where there is little or no difficulty caused by the varying width.



Rotation strip cropping with terracing. Rows of clean-tilled crops are measured both ways from the guide terraces, T-2 and T-4. Irregular areas are planted to close-growing crops. The second year the strips of row crops will follow T-1, T-3 and T-5 as guide terraces.

Strip cropping is usually applicable wherever crop rotation is used. On steeper slopes even the combination of strip cropping, crop rotation and the incorporation of green manure may not suffice to control erosion. Terraces may be needed in addition to the above cultural practices, as well as subsoiling, basin-listing and other tillage practices, to adequately conserve the soil and water on steep slopes. If it is not practical on the basis of crop returns to apply all of these control measures, the land should be used for other purposes. The maintenance of a good rotation is one of the main steps in setting up a strip cropping system, and the crop sequence within or between the strips themselves is especially important. No two cultivated crop strips or no two strips having the same planting or harvesting dates should be adjacent to each other.

INCORPORATION OF ORGANIC MATTER

The soil is a reservoir for water and plant food. Under the conditions of a permanent cover forces of nature are continually adding to the supply of the nutrients in this "reservoir". But when continuous cropping is practiced, the supply in the reservoir is drawn out much faster than natural forces can add to it. Therefore, crop yields soon drop to a low level and remain at that level, which is usually near or below the cost of production, unless we purposely aid in replenishing the supply of plant food. This is done by the addition of organic manures, green manure crops and commercial fertilizers.

The California Agricultural Experiment Station Circular 255, "Leguminous plants as organic fertilizers in California agriculture", stresses the fact that "the arable lands, orchard and grain, have been slowly but surely becoming less fertile with a steady, decline in crop yields. This exploitation of soil fertility by the removal of the crop, the burning out of organic matter and the leaching out of the nutritive properties of the soil deserves serious consideration from the urban as well as the rural population of every community."

The improvement in the physical condition of the soil, effected by plowing under organic matter, is as important as the contribution of plant food that it makes. One of the most important functions of humus from a soil fertility standpoint is to make the soil habitable for the bacterial flora which play such a large part in the formation of plant food.

From the erosion control standpoint, adding organic matter in the form of green manure is a doubly approved practice, since the crop serves as a ground cover or cover crop prior to its incorporation into the soil as green manure.

The following lists of legumes are recommended as green manure crops in California:

Winter Growing

Huban clover
Bitter clover
Bur clover
Fenugreek
Tangier pea
Horse beans (small-seeded)
Garbanzos
Hairy vetch
Purple vetch
Lupines

Summer growing

Cowpeas
Soybeans
Tepary bean
Berseem clover
Mung bean
Moth bean
Sesbania
Alfalfa

Sandy Soil

Bitter clover
Hairy vetch
Bur clover
Lupines
Cowpeas
Soybeans

Alkali tolerant

Berseem clover
Sweet clover
Huban clover
Alfalfa
Hairy vetch
Horse beans (small-seeded)

Heavy Soil

Tangier pea
Horse bean (small-seeded)
Mung bean
Sesbania
Fenugreek

MEADOW STRIPS AND GRASSED WATERWAYS

In almost every cultivated field there are natural depressions, swales, or draws down which water normally tends to flow. When planted to grass and the vegetation established, the channels are protected and can aid in the safe removal of water from fields. These waterways may be used to conduct water from terrace outlets, diversion ditches or strip-crop rows. One of the common mistakes in providing grassed waterways is to make them too small. This not only is likely to allow the water to cut a new channel down either side of the grass, but also makes maintenance difficult. Coarse and strong sod-forming grasses may be planted in the bottom and sides of what now are field gullies. When these gullies are partly filled by the gradual accumulation of soil, they will constitute satisfactory meadow strips and the herbage may be used for pasture or cut for hay.

Other smaller sod-forming grasses are suitable for planting in wide meadow strips where there is sufficient moisture. These may be made more effective (and also more profitable when grazed or cut for hay) if a legume is planted with the grass. Alfalfa, sweet clover, white or ladino clover, strawberry clover and other legumes, and the non-legume burnet will improve the quality of the forage or hay of grassed waterways and meadow strips.

GRASSES SUITABLE FOR LARGE GULLIES AND BARRANCAS

Beardless wild rye
Centipede grass
Giant reed grass
Giant wild rye grass
Napier grass
Western wheatgrass
Pampas grass

GRASSES SUITABLE FOR MEADOW STRIPS

Beardless wild rye
Bermuda grass
Blue grass
Centipede grass
Crested wheatgrass
Harding grass
Red top
Rhodes grass
Rye grass

Note: All species named are not suitable for all conditions. The kind of grass to be used must be carefully selected according to all the conditions of the planting site, including consideration of the crops in the adjacent fields and the possibility of mixtures of the above legumes and grasses. --Paul B. Dickey

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FORESTRY IN LAND USE PLANNING

INTRODUCTION

Land or soil is the basic resource upon which all of our work and planning depends, no matter what branch of agriculture or conservation we follow. Fortunately, it is the one resource that can be kept continuously productive without detriment to itself or to other resources dependent upon it. It is not necessary to dwell upon the history of the use or misuse of land in this country. Our heritage of private ownership and stewardship of the soil without regard to the public good is well known. The farmer, miner and lumberman have been blamed for many abuses of our natural resources when, in reality, the pressure of the economic system has been the principal factor in causing liquidation of those resources. A common example is the lumber industry which has been forced by high taxes, excessive transportation costs, and extremely high capital requirements to cut timber without regard to future lumber needs. The breaking up of the dust bowl range lands for cultivated crops was the result of increased demand for certain agricultural products. It is preposterous to expect any industry to forego present profit to promote possible future stability.

Most farmers have for generations worked the soil in the easiest way, commensurate with profit, and have substituted new methods of cultivation with hesitancy. Until recently empirical methods have been the only means of introducing new equipment or procedure to farmers. If new farm practices are to be accepted by the farmers, they must be shown that the annual income will not be reduced but will be increased and continued indefinitely.

The people of some of the progressive countries of Europe have come to a realization that every acre of land has a definite value and a particular use. That is the ultimate objective in land use planning and is our goal in this country.

THE PROBLEM

Farms having areas of so-called idle or wild land have need for woodland management so that all areas may be completely utilized. Such areas are assessed and taxed and thus require an annual outlay for their retention. Often, they cost more than the annual expenditure for taxes by allowing silt and uncontrolled water to be discharged onto more valuable land below. If the land is being held only for development purposes, how better can this acreage be increased in value than by growing trees which check erosion, run-off, and evaporation; increase percolation; and add to the beauty of the land?

Consider the following hypothetical case: a farm of 80 acres has 20 acres in orchard, 55 acres used as pasture land, 2 acres covered by farm buildings and yards, and 3 acres of so-called idle or waste land. Most of the waste land is along or in gullies on the farm and is not being used at the present time, although soil is of average quality. It may have never occurred to the farmer to make use of the three acres, even though his other farm and grazing practices are progressive.

If the grazing and idle land is assessed at $10.00 per acre, at a tax rate of $1.30 per $100.00, the farmer is paying each year approximately $.40 in taxes for the 3 acres and is receiving no benefit from the area. Further, he has 10,000 feet of fencing on his property involving 1,000 posts which must be replaced at the rate of 66 posts per year, assuming the average life of the posts to be 15 years. It is necessary for this farmer to buy 2 cords of fuel wood each year for use in a fireplace. With posts at $.55 each and fuel wood at $12.00 a cord, $60.30 is spent annually for wood products. The use of metal posts increases the initial cost per post so that in spite of a doubled life span, $23.10 would be the amount chargeable to depreciation or replacement as against an annual depreciation or replacement cost of $36.30 for wood posts. This presupposes that the material is purchased at present local prices, which will of necessity be used throughout this discussion.

What benefit can be derived by utilizing these three acres for a permanent woodlot? Let us further assume that the farmer plants the trees, which can be done during the rainy season when his other work is slack. At a spacing of 6x6 feet he will have 3630 trees on his 3 acres and with reasonable care, he can expect to have 1,000 trees per acre. For the first 10 years, he will receive practically no yield from the woodlot.

During the tenth year, a thinning would be made, reducing the stand to 2400 trees and yielding the following products:

Fence posts	100
Cord of fuel (500 trees)	8

As stated, the farmer would use 66 fence posts and two cords of wood, leaving 34 fence posts and 6 cords of wood which could be sold to local markets.

Every succeeding year he would cut 160 trees by a selection system that would increase the quality of the stand and provide for natural reproduction of the stand in perpetuity. In the second ten year period, the woodlot could be expected to yield approximately the following products:

Fence posts	1160
Cords of fuel wood	35

Had he used the higher priced iron posts, there would have been the continuous outlay for fuel and, needless to say, the metal fence posts must be purchased new for replacement, whereas the wood posts are produced on the farm.

The rotation has been set at 15 years, which means that one-fifteenth of the growing stock is cut each year and when the cut is made during the fifteenth year, the area first cut will be 14 years old and ready to cut the next year. On less favorable sites, the rotation would necessarily be longer and the products less valuable. However, certain species can be expected to yield such products as mentioned in a rotation of 15 years. It is not intended to imply that all or any idle land on a particular farm would give the results given in the hypothetical problem, but there are many small areas inaccessible or unfit for cultivation that could profitably be put into woodlots.

Little mention has been made of other less tangible values that should be ascribed to woodland areas. Many of the larger ranches in Southern California have considerable areas that are covered with brush or chaparral composed generally of species unpalatable to livestock, thus precluding the use of such areas, even for range land. Although little direct income can be expected from such areas, they should be included in land use planning by setting forth the value and use of such land. If the soil is of good depth and quality, it presents an opportunity of gradually introducing more valuable species until a desirable woodlot is obtained. Where soil and climatic conditions are so severe that only chaparral species can grow, the production of wood products is out of the question, and special use values must be considered. Management of the game resources may produce direct income from hunting fees, as well as promote wildlife which, in turn, protects crops from insect infestations. Vegetation on the hillsides checks erosion, prevents excessive run-off and silting of lands below, and aids percolation of water into the soil. Experiments at the San Dimas Experimental Forest show that litter (leaves, twigs, dead tops and roots of plants) on and in the soil reduces run-off approximately 25 per cent, reduces evaporation of water from the soil by about 18 per cent, and increases percolation of water into the soil 36 per cent.

What does this mean to the farmer? Is not efficient protection against silting, gullying, and washing of valuable crop land of direct value to the farmer? The increased water diverted into the soil, the reduction of evaporation, and retardation of run-off mean a higher water table, more available water for the crops and retention of the land in the best possible condition. In some instances chaparral-covered hills have been ascribed a value of $5,000 per acre for watershed purposes alone. Realty values have been known to increase hundreds of dollars per acre because of trees planted on development areas.

Many conservationists are advancing the theory that the land is a national resource, and the social responsibility of using the soil in such a way that it will be continuously productive rests upon the land owner. Others advocate Federal legislation requiring land owners to follow such farming practices as will keep the land in the best possible condition for posterity. When a land use program can be presented to a cooperator, showing definite benefits to him in the way of increased yields of crops, continued soil fertility, and a stabilized farm, legislation for protection of the nation's natural resources will not be needed.

--Lee O. Hunt, Project Forester,
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